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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/014,886      | 12/14/2001  | Toshiyuki Toyoshima  | 401480              | 2371             |

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EXAMINER

PATEL, ISHWARBHAI B

ART UNIT PAPER NUMBER

2827

DATE MAILED: 11/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

12

|                              |   |   |  |
|------------------------------|---|---|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/014,886    | <b>Applicant(s)</b><br>TOYOSHIMA ET AL. |  |
|                              | <b>Examiner</b><br>Ishwar (I. B.) Patel | <b>Art Unit</b><br>2827                 |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1) ☒ Responsive to communication(s) filed on 30 July 2003, (election).

2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4) ☒ Claim(s) 1-10 and 12-14 is/are pending in the application.

4a) Of the above claim(s) 5 and 6 is/are withdrawn from consideration.

5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.

6) ☒ Claim(s) 1-4, 7-10 and 12-14 is/are rejected.

7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.

8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on 14 December 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☒ All    b) ☐ Some \*    c) ☐ None of:

1. ☒ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

|   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                           | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413) Paper No(s). <u>1103</u> . |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)                   |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) : . | 6) <input type="checkbox"/> Other: .  |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election with traverse of specie 1, reading on figure 2, claims 1-4, 7-10 and 12-14, in Paper filed on July 30 2003 is acknowledged. The traversal is on the ground(s) that the specie election requirement is confusing and omits reference to all the figures 1, 3A-3B and 5-13. This is not found persuasive because there are two different embodiments of the coupler, one as shown by figure 2 and the other as shown by figure 4A-4B, and different embodiments constitute different species.

Figure 1 is showing a device with coupler, figures 3A-3B are showing a process for forming a coupler. Figures 5-13 are showing either detail of the coupler or the process steps for forming the coupler or the device.

Claims 5 and 6 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected specie.

The requirement is still deemed proper and is therefore made FINAL.

### ***Claim Objections***

2. Claim 10 is objected to because of the following informalities: the amended claim 10 is depending from claim 1, but in remarks of response filed on July 30, 2003, page 4, line 4-6, it was shown as depending from claim 9.

For the examination purpose, claim 10 is considered as depending from claim 9 (see interview summary).

Appropriate correction is required in response to this office action.

***Priority***

3. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d).

Also acknowledged is the receipt of the certified copy of the priority document, which has been placed of record in the file.

***Drawings***

4. The drawings are objected to because the figures are improperly cross-hatched. All of the parts shown in section, and only those parts, must be cross-hatched. The cross hatching patterns should be selected from those shown on page 600-114/115 of the MPEP based on the material of the part. See also 37 CFR 1.84(h)(3) and MPEP § 608.02.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 4 and 10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 4 and 10, the applicant is claiming the electrically conductive member comprises a metal powder with **high melting point**. It is unclear to the examiner as to what the applicant regards as the high melting point.

High melting point is a relative term and a clarification needed as to what constitute a high melting point.

Due to the lack of explanation on this subject matter, the examiner assumes conductive member comprises a metal powder.

#### ***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000.

Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the ALPA (pre-ALPA 35 U.S.C. 102(e)).

8. Claims 1,3,4,7, 9 and 10 are rejected under 35 U.S.C. 102(e) as being anticipated by Takezawa et al., US Patent No. 6,465,082, hereafter, Takezawa.

Regarding claim 1, Takezawa discloses an electronic device comprising:  
an element-carrying-substrate (39) having an electronic element (38) and a first electrode (41b), the first electrode being disposed on a surface of the element-carrying-substrate and having a first area (see figure 11a, column 9, line 33-50);

a wiring substrate (37) facing the element-carrying-substrate and having a second electrode (41a) disposed on a surface of said wiring substrate, the second electrode having a second area and facing the first electrode (see figure 11A, column 9, line 33-50); and

a coupler disposed between the first electrode and the second electrode, joining the element-carrying-substrate to the wiring substrate, the coupler having a resin body, an electrically conductive member, and a surface comprising a resin region and an electrically conductive region electrically connecting the first electrode to the second electrode (stress relaxation component 41 with solder layer 42, see figure 11A, column 9, line 33-50 and further detail of the stress relaxation member 15 made of thermoplastic resin and copper or solder powder, figure 3, column 6, line 42-68 and column 7, line 1-10, including the solder layer 16, column 7, line 16-35).

Regarding claim 3, Takezawa further discloses the electrically conductive member is joining metal and the electrically conductive region includes the joining metal that is located on the surface of the coupler (solder layer 16, column 16-35 and conductive filler 17, figure 3).

Regarding claim 4, as interpreted by the examiner, Takezawa further discloses the electrically conductive member comprises a metal powder (17) and the electrically conductive region includes the metal powder that is located on the surface of the coupler, the metal powder being joined to a joining metal film (conductive filler 17 as shown in figure 3, with a solder layer 16 connecting the filler 17, column 7, line 16-35 or see figure 11a, solder layer 42).

Regarding claim 7, Takezawa further discloses the resin body is a thermosetting resin, column 7, line 1-10.

Regarding claim 9, Takezawa discloses a coupler with a spherical shape comprising a blend of a joining metal (solder layer 16) and a resin (18), wherein the coupler includes a surface comprising an electrically conductive region formed by the joining metal and a resin region formed by the resin (stress relaxation member with resin body made of thermosetting resin and copper or solder powder, column 6, line 42-68 and column 7, line 1-10, including the solder layer 16, column 7, line 16-35).

Regarding claim 10, as interpreted by the examiner, Takezawa further discloses a resin body (18) and a metal powder (17), wherein the metal powder that is located on the surface of the coupler is joined to the joining metal (solder layer 16) to form the electrically conductive region (stress relaxation member with resin body, column 6, line 42-68 and column 7, line 1-10, including the solder layer 16, column 7, line 16-35).

Regarding claim 13, Takezawa further discloses the resin body is a thermosetting resin, column 7, line 1-10, as applied to claim 7 above.

***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 2, 8, 12 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takezawa, as applied to claims 1,3,4,7,9 and 10 above and further in view of Roldan et al. US Patent No. 6,005, 292, hereafter, Roldan.

Regarding claims 2 and 12, the applicant is further claiming the resin region occupies from 20 to 80 % of the surface of the coupler.



Takezawa discloses electronic device with coupler (the stress relaxation mechanism member), but fails to explicitly disclose the surface area occupied by resin region is 20 to 80% of the surface of the coupler.

However, the stress relaxation mechanism member (coupler) of Takezawa is made conductive by adding conductive powder into the resin, and with enough conductive powder to have the desired electrical conductivity.

Roldan discloses an interconnection for electronic device with a conductive bond with at least 30 % volume percent of the conductive metal particles based on the total volume of the metal particles and thermoplastic polymer to enhance the performance of the conductive bond and have desired conductivity and mechanical strength.

A person of ordinary skill in the art would have recognized that the conductivity of the coupler can be changed by changing the relative proportion of conductive powder / filler material and insulating resin to have the desired conductivity and optimize the performance of the coupler, and the right proportion of the conductive metal particles and the resin will yield the relative surface area of the coupler, the surface area occupied by the conductive metal particles and the surface area occupied by the resin material.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to provide the coupler of Takezawa with the proportion of conductive metal particles and resin, which yield a surface of resin region occupying 20 to 80% of the surface of the coupler, from the teachings of Roldan, in order to optimize the performance of the coupler and to have better electrical conductivity and strong mechanical strength at connection points.

Further, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller*, 105 USPQ 233 (CCPA 1980).

Regarding claims 8 and 14, the applicant is further claiming a resin body of thermoplastic resin.

Takezawa discloses electronic device with coupler (the stress relaxation mechanism member) made of resin body but fails to explicitly disclose the coupler with the resin body made with thermoplastic resin.

Roldan discloses electrically conductive composite bump with thermoplastic resin, column 4, line 40-48. The bump with the body made of thermoplastic resin will provide a better reworkability for carrying out repairs in the field where a non-functional chip can be replaced with a functional chip. Further, thermoplastic resin will provide better elasticity to avoid crack.

One of ordinary skill in the art at the time of applicant's invention would have clearly recognized that it is quite advantageous for the coupler of electronic device of Takezawa to be made of thermoplastic resin body to have better reworkability for carrying out repairs in the field.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was to provide the coupler of Takezawa with thermoplastic resin body, from the teachings Roldan, in order to have better reworkability for carrying out repairs in the field.

Further, it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

### ***Conclusion***

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Cobbley et al., discloses an apparatus with face-to-face connection of a die face to a substrate with polymer bump.

Chang et al., discloses a composite bump with polymer body with solder coating.

Benenati et al., discloses an assembly with ball connector having conductive paste holding the conductive ball.

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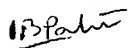
Tazaki Kozi et al., discloses semiconductor device with a resin conductive ball having conductive layers.

JP11233682A discloses a semiconductor device with a resin sphere body having coating of metal plating.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ishwar (I. B.) Patel whose telephone number is (703) 305 2617. The examiner can normally be reached on M-F (8:30 - 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo can be reached on (703) 308 1233. The fax phone number for the organization where this application or proceeding is assigned is (703) 305 3431.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305 3900.



I B Patel  
Patent Examiner  
GAU: 2827